

Application No. 10/820,317
Amendment dated April 15, 2005
Reply to Office Action of December 28, 2004

AMENDMENTS TO THE CLAIMS

1. (Original) A fueling system for a vehicle comprising:

a fuel storage tank for containing liquid fuel and an ullage space;

a fuel pump for pumping the liquid fuel from the storage tank to a fuel tank of the vehicle;

a nozzle assembly coupled to a hose for delivering the fuel being pumped from the storage tank to the fuel tank;

a vapor pump coupled to the hose and in communication with the nozzle for extracting vapor displaced from the fuel tank and delivering the vapor to the ullage space of the fuel storage tank;

a vapor flow meter in communication with the vapor pump for measuring a flow rate of the vapor;

a fuel flow meter in communication with the fuel pump for measuring a flow rate of the fuel; and

a diagnostic agent in communication with the vapor flow meter and the fuel flow meter to generate a ratio of the flow rate of the vapor to the flow rate of the fuel.

2. (Original) The fueling system of claim 1 further comprising:

a control interface in communication with the diagnostic agent and at least one of the fuel pump and the vapor pump to provide a feedback signal to the at least one

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pump to adjust the flow through the at least one pump based on the ratio of the vapor and fuel flow rates.

3. (Original) The fueling system of claim 2 wherein the control interface is in communication with both the fuel and vapor pumps and is adapted to adjust the flow of both the fuel and vapor pumps.

4. (Original) The fueling system of claim 1 further comprising:
a fuel dispenser assembly coupled in fluid communication with the fuel storage tank and the nozzle via the hose.

5. (Original) The fueling system of claim 4 wherein the diagnostic controller is contained in the fuel dispenser assembly.

6. (Original) The fueling system of claim 4 wherein the diagnostic controller is remote from the fuel dispenser assembly.

7. (Original) The fueling system of claim 2 wherein the flow rate of the at least one pump is adjusted so that the ratio of the vapor flow rate to the fuel flow rate is about 1.0.

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8. (Original) A dispenser assembly for pumping fuel from a fuel storage tank through a hose and out of a nozzle into a vehicle fuel tank, the dispenser assembly comprising:

a fuel pump adapted to pump the liquid fuel from the storage tank to the vehicle fuel tank;

a vapor pump adapted to be coupled to the nozzle for extracting vapor displaced from the fuel tank and delivering the vapor to an ullage space of the fuel storage tank;

a vapor flow meter adapted to be in communication with the vapor pump for measuring a flow rate of the vapor;

a fuel flow meter adapted to be in communication with the fuel pump for measuring a flow rate of the fuel; and

a diagnostic agent in communication with the vapor flow meter and the fuel flow meter to generate a ratio of the flow rate of the vapor to the flow rate of the fuel.

9. (Original) The dispenser assembly of claim 8 further comprising:

a control interface in communication with the diagnostic agent and at least one of the fuel pump and the vapor pump to provide a feedback signal to the at least one pump to adjust the flow through the at least one pump based on the ratio of the vapor and fuel flow rates.

10. (Original) The dispenser assembly of claim 9 wherein the control interface is

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in communication with both the fuel and vapor pumps and is adapted to adjust the flow of both the fuel and vapor pumps.

11. (Original) The dispenser assembly of claim 8 wherein the diagnostic agent is contained in the dispenser assembly.

12. (Original) The dispenser assembly of claim 8 wherein the diagnostic agent is remote from the dispenser assembly.

13. (Original) The dispenser assembly of claim 9 wherein the flow rate of the at least one pump is adjusted so that the ratio of the vapor flow rate to the fuel flow rate is about 1.0.

14. (Original) A method of dispensing fuel from a fuel storage tank through a hose and out of a nozzle into a vehicle fuel tank, the method comprising the steps of:

pumping fuel from the storage tank through the hose and out of the nozzle into the vehicle fuel tank;

measuring a flow rate of the fuel being pumped;

pumping vapor from the vehicle fuel tank through the hose and into the fuel storage tank;

measuring a flow rate of the vapor being pumped; and

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calculating a ratio of the vapor flow rate to the fuel flow rate.

15. (Original) The method of claim 14 further comprising:

adjusting the flow rate of one of the vapor and the fuel to obtain a desired ratio of the vapor flow rate to the fuel flow rate.

16. (Original) The method of claim 14 further comprising:

adjusting the vapor flow rate to obtain a desired ratio of the vapor flow rate to the fuel flow rate; and

adjusting the fuel flow rate to obtain the desired ratio.

17. (New) A fueling system for a vehicle comprising:

a fuel storage tank for containing liquid fuel and an ullage space;

a fuel pump for pumping the liquid fuel from the storage tank to a fuel tank of the vehicle;

a nozzle assembly coupled to a hose for delivering the fuel being pumped from the storage tank to the fuel tank;

a vapor pump coupled to the hose and in communication with the nozzle for extracting vapor displaced from the fuel tank and delivering the vapor to the ullage space of the fuel storage tank;

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a vapor flow meter in communication with the vapor pump for measuring a flow rate of the vapor;

a fuel flow meter in communication with the fuel pump for measuring a flow rate of the fuel;

a diagnostic agent in communication with the vapor flow meter and the fuel flow meter to generate a ratio of the flow rate of the vapor to the flow rate of the fuel; and

a control interface in communication with the diagnostic agent and both the fuel and vapor pumps to provide a feedback signal to the fuel and vapor pumps to adjust the flow through the fuel and vapor pumps based on the ratio of the vapor and fuel flow rates.

18. (New) A dispenser assembly for pumping fuel from a fuel storage tank through a hose and out of a nozzle into a vehicle fuel tank, the dispenser assembly comprising:

a fuel pump adapted to pump the liquid fuel from the storage tank to the vehicle fuel tank;

a vapor pump adapted to be coupled to the nozzle for extracting vapor displaced from the fuel tank and delivering the vapor to an ullage space of the fuel storage tank;

a vapor flow meter adapted to be in communication with the vapor pump for measuring a flow rate of the vapor;

a fuel flow meter adapted to be in communication with the fuel pump for measuring a flow rate of the fuel; and

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a diagnostic agent in communication with the vapor flow meter and the fuel flow meter to generate a ratio of the flow rate of the vapor to the flow rate of the fuel.

a control interface in communication with the diagnostic agent and both the fuel and vapor pumps to provide a feedback signal to the fuel and vapor pumps to adjust the flow through the fuel and vapor pumps based on the ratio of the vapor and fuel flow rates.